

What is claimed is:

[Claim 1] A copper interconnect comprising:

an impure copper seed layer derived from an impure copper source with a content of impurities that is deposited on a barrier layer, said barrier layer prevents substantial diffusion of copper through to an underlying insulating layer; and,

an impure copper derived from an impure copper source with a content of impurities that fills an opening in said underlying insulating layer.

[Claim 2] A copper interconnect as in claim 1, wherein said copper source of said impure copper seed layer is equivalent to said copper source of said impure copper.

[Claim 3] A copper interconnect as in claim 1, wherein said impurity content comprises not more than 1.20% by weight and not less than or equal to 0.001% by weight of said at least one of said impure copper seed layer and said impure copper.

[Claim 4] A copper interconnect as in claim 1, wherein prior to deposition, said impure copper in said impure copper seed layer is substantially equivalent to said impure copper.

[Claim 5] A copper interconnect as in claim 1, wherein said copper in said impure copper source comprises impurities chosen from the group of Ag, As, C, Cd, Cl, Co, Cr, Fe, In, Mg, Mn, N, Ni, O, Pb, S, Sn, Tl, and Zn.

[Claim 6] A method for forming a copper interconnect, comprising the steps of:

depositing an impure copper seed layer derived from an impure copper seed source with a content of impurities on a barrier layer, said barrier layer prevents substantial diffusion of said copper through to an underlying insulating layer and lines an opening in said underlying insulating layer; and,

filling said opening with impure copper derived from an impure copper seed source with a content of impurities.

[Claim 7] A method as in claim 6, wherein said copper source of said impure copper seed layer is equivalent to said copper source of said impure copper.

[Claim 8] A method as in claim 6, wherein said impurity content comprises not more than 1.20% by weight and not less than or equal to 0.001% by weight of said at least one of said impure copper seed layer and said impure copper.

[Claim 9] A method as in claim 6, wherein said impure copper source comprises impurities chosen from the group of Ag, As, C, Cd, Cl, Co, Cr, Fe, In, Mg, Mn, N, Ni, O, Pb, S, Sn, Tl, and Zn.

[Claim 10] A method as in claim 6, wherein prior to deposition, said impure copper in said impure copper seed layer is substantially equivalent to said impure copper.

[Claim 11] A method as in claim 6, wherein said impure copper seed layer is deposited by at least one of sputtering, PVD, CVD, IPVD, and ALD.

[Claim 12] A method as in claim 6, further comprising the step of:
chemical mechanically polishing said impure copper seed layer, said barrier layer, and said impure copper, until said impure copper seed layer, said barrier layer, and said impure copper are planarized to said insulating layer.

[Claim 13] A copper interconnect comprising:

an insulating layer that has an opening;

a barrier layer that prevents substantial diffusion of copper through to said underlying insulating layer that is deposited on said underlying insulating layer and lines said opening;

an impure copper seed derived from an impure copper seed source with a content of impurity that is deposited on said barrier layer and fills said opening.

[Claim 14] A copper interconnect as in claim 13, wherein said impurity content comprises not more than 1.20% by weight and not less than or equal to 0.001% by weight of said impure copper seed layer.

[Claim 15] A copper interconnect as in claim 13, wherein said impure copper from said impure copper seed source comprises impurities chosen from the group of Ag, As, C, Cd, Cl, Co, Cr, Fe, In, Mg, Mn, N, Ni, O, Pb, S, Sn, Tl, and Zn.

[Claim 16] A method for forming a copper interconnect, comprising the steps of:

depositing an insulating layer;
etching an opening in said insulating layer;
depositing a barrier layer that prevents copper diffusion through to said insulating layer, which lines said opening, in said insulating layer; and,
filling said opening with impure copper seed derived from an impure copper seed source with a content of impurities.

[Claim 17] A method as in claim 16, wherein said impurity content comprises not more than 1.20% by weight and not less than or equal to 0.001% by weight of said at least one of said impure copper seed.

[Claim 18] A method as in claim 16, further comprising the step of:

chemical mechanically polishing said impure copper seed and said barrier layer until said barrier layer and said impure copper seed are planarized to said insulating layer.

[Claim 19] A method as in claim 16, wherein said impure copper seed source comprises impurities chosen from the group of Ag, As, C, Cd, Cl, Co, Cr, Fe, In, Mg, Mn, N, Ni, O, Pb, S, Sn, Tl, and Zn.

[Claim 20] A method as in claim 16, wherein said impure copper seed is deposited by at least one of sputtering, PVD, CVD, IPVD, and ALD.

